Smart Bridge Developing based on Micro-Truss Optimization Method

Y. Yokotani[1]*, I. Ario[1] , Y. Chikahiro[2] and M. Nakazawa[3]

[1] Department of Civil & Environmental Engineering, Hiroshima University, Higashihiroshima, Japan
Emails: m185931@hiroshima-u.ac.jp, mario@hiroshima-u.ac.jp

[2] Department of Water Environment & Civil Engineering, Shinshu University, Nagano, Japan
Email: chikahiro@shinshu-u.ac.jp

[3] Department of Civil Engineering, Tohoku Gakuin University, Japan
Email: naka@mail.tohoku-gakuin.ac.jp

ABSTRACT

The damage and destruction to social infrastructure by natural disasters, such as earthquakes, floods, landslides and tsunamis in the world, are serious problems in disaster prevention for the inhabitants of a stricken area. There are assembling block type of temporal bridge to serve as lifelines after a disaster has occurred. However, they are not based on the design concept of an urgent bridge that can be used quickly to save lives at the stricken area. So we need to develop a new bridge of rescue type to survive victims. In other words, we have to consider how to rebuild damaged infrastructure and how to build a new type of rescue system which can be implemented quickly because time is very important when trying to save lives after an emergency.

On the other hand, in recent years, the optimum design approaches such as the grand-structure method, the homogenization method, the genetic algorithm, biomechanics, and the cellular automata have been developed as analytical computing methods to create the layout form of a bridge structure. These approaches tackle an issue known as the problem of optimizing a structural topology [1]. Here, the micro-truss technique that relates to this topological optimization is used as a way to decide on the form of a bridge [2]. The design and production of experimentation on a prototype of the smart bridge *Mobilebridge* [3] [4], whose structure was determined by looking at the scissors structure with digital optimum structure in the optimal result, were executed. And the potential application of this bridge was estimated. Using scissors structure as the method of deploying the structure, we can quickly recovery the bridge on the disaster area. From this study on the optimization structure using micro-truss model, the smart and deployable bridge *Mobilebridge*, as the emergency bridge at the time of disaster, is designed.

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